



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8**

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Ref: 8EPR-SA

March 21, 2011

Memo

To: File – Rico Argentine Mine Site – St Louis Tunnel/Ponds, Rico, CO
(SSID # 08BU – OU1)

From: Steven Way, OSC

Subject: Cost Estimate – Removal Action PRP Lead 2011 – 2014

Attached is a cost estimate for the purpose of determining potential costs and establishing a value required for financial assurance at the Site to conduct the Removal Action set forth in the March 9, 2011 Work Plan. The estimate is for the costs associated with implementing the tasks in the Work Plan and does not include future operating costs. This approach was used because it is anticipated that the long-term operation and maintenance phase will be regulated under permit conditions administered by the State. Bonding or other financial assurance mechanisms required by the State will be required at that time. If permits are not issued and associated financial assurance requirements are not set forth, then EPA will re-evaluate financial assurance requirements to ensure the ability to continue implementing and maintaining the remedy put in place at the Site.

The work is to be conducted by Atlantic Richfield (AR) and portions of the estimate reflect actions that AR proposed in a draft Work Plan including those plans to implement a water treatment system at the Site. Other tasks required by the Work Plan, such as adit hydraulic controls and mine source water controls, involve actions that require additional investigation before more detailed plans can be developed. While the exact actions for those tasks are still uncertain, the conceptual alternatives used for estimating purposes are appropriate to consider as part of the cost estimate. The long term benefit of these actions may be a substantial savings in water treatment costs over the life of a system operated at this Site. The cost estimate is broken down by tasks and subtasks and also presented in a summary with a total cost estimated at \$6,017,361 for work to be performed over the next three years.

Attachment

Rico Argentine Site - Rico Tunnels Cost Estimate Summary

			<u>Capital</u>	
Monitoring - 3 years			\$	104,800
Solids Management				
Capital			\$	683,520
Initial Solids			\$	555,220
Repository				
Capital	Year 0		\$	1,049,319
Solids Placement	Initial		\$	294,267
Adit Controls				
Investigations, Memos			\$	40,000
Capital			\$	1,607,732
Source Water Investigation and Controls				
			\$	750,000
Water Treatment				
Investigations			\$	150,000
Capital			\$	1,173,043
TOTAL			\$	6,407,901

Monitoring

	<u>Number</u>	<u>Unit</u>	<u>Unit Cost</u>	<u>Total Cost</u>	<u>Total - 3 years</u>	<u>Notes</u>
Ongoing Flow Measurements						
Purchase and Install Flow Meters	1	ls	\$ 20,000.00	\$ 20,000.00	1 \$ 20,000.00	
Quarterly Downloads						
Site visit	4	ea	\$ 300.00	\$ 1,200.00	3 \$ 3,600.00	
Data management	4	ls	\$ 300.00	\$ 1,200.00	3 \$ 3,600.00	
Sampling Events						
SAP/QAPP				\$ 4,000.00	1 \$ 4,000.00	
3 Events						
Planning	30	hours	\$50	\$ 1,500.00	3 \$ 4,500.00	
Sample Collection and Flow Measurement	72	hours	\$100	\$ 7,200.00	3 \$ 21,600.00	2 people total of 12 hours each per sample event
Ship samples	3	ls	\$ 200.00	\$ 600.00	3 \$ 1,800.00	
Analytical	24	ea	\$350	\$ 8,400.00	3 \$ 25,200.00	
Data management and reporting	30	hours	\$ 50.00	\$ 1,500.00	3 \$ 4,500.00	
Evaluate flow data trends	40	hours	\$ 100.00	\$ 4,000.00	2 \$ 8,000.00	One evaluation after 1 year; reevaluation after 3 years
Evaluate water quality data trends	40	hours	\$ 100.00	\$ 4,000.00	2 \$ 8,000.00	
TOTAL COST				\$ 53,600.00	\$ 104,800.00	
				1 year	3 years	

Management of Precipitation Solids

	<u>Quantity</u>	<u>Unit</u>	<u>Unit Cost</u>	<u>Total Cost</u>	<u>Notes</u>
Drying Facility(ies)					
Site Prep and Liner					Assume Solids Management Plan is included as part of design costs.
Grade and compact subgrade	4840	sy	\$ 3.00	\$ 14,520.00	Assume 1 acre drying facility
Run-on/runoff controls					
Construct	840	lf	\$ 50.00	\$ 42,000.00	
Place Riprap	840	cy	\$ 25.00	\$ 21,000.00	
Drainage layer of sand/gravel	4840	cy	\$ 15.00	\$ 72,600.00	3 foot sand/gravel layer
PVC piping to convey leachate to pond system	500	lf	\$ 35.00	\$ 17,500.00	
Berms					
Process, haul, and place compacted soils for the berms	2333	cy	\$ 7.00	\$ 16,333.33	
Re-locate drying facility				\$ 91,976.67	Assume 50 percent of costs are incurred again
Treatment system				\$ 50,000.00	
Pond Stability Analysis and Upgrades					
Geotechnical evaluation of pond dike structures				\$ 40,000.00	
Hydrologic evaluation of flooding conditions				\$ 20,000.00	
Construct stability upgrades					Assume 8 foot high zone of 900 linear feet of berms require riprap protection, 3' deep
Riprap bank	800	cy	\$ 23.00	\$ 18,400.00	Uncertainty because no information regarding distance to source of riprap.
			Subtotal	\$ 404,330.00	
General					
Administration			4.25%	\$ 17,184.03	
Quality			1.75%	\$ 7,075.78	
Temporary Facilities			1.25%	\$ 5,054.13	
Mobilization, Execution, and Demobilization			7.75%	\$ 31,335.58	
			Subtotal	\$ 464,979.50	
Other Costs					
Contingency		20%		\$ 92,995.90	
Project and Construction Management		15%		\$ 69,746.93	
Engineering Design		12%		\$ 55,797.54	
			TOTAL CAPITAL COST	\$ 683,519.87	
Initial Solids Removal and Placement in Drying Cell (See calculations and assumptions below)					
Excavate and Place Solids	34000	cy	\$ 10.00	\$ 340,000.00	Estimated
General					
Administration			4.25%	\$ 14,450.00	
Quality			1.75%	\$ 5,950.00	
Temporary Facilities			1.25%	\$ 4,250.00	
Mobilization, Execution, and Demobilization			7.75%	\$ 26,350.00	
			Subtotal	\$ 391,000.00	

Management of Precipitation Solids

	<u>Quantity</u>	<u>Unit</u>	<u>Unit Cost</u>	<u>Total Cost</u>	<u>Notes</u>
Other Costs					
Contingency		15%		\$ 58,650.00	
Project and Construction Management		15%		\$ 58,650.00	
Engineering Design		12%		\$ 46,920.00	
TOTAL INITIAL SOLIDS REMOVAL COSTS				\$ 555,220.00	

Notes:

Solids volume for initial placement in ponds

Assume:

Volume for disposal - Assume 1996 Paser solids volume estimate of 68,000 is reduced by 1/2 after in-pond drying

50% reduction in solids reported by Atlantic Richfield

68,000/2 = 34000 cy to drying facility

Repository

	<u>Number</u>	<u>Unit</u>	<u>Unit Cost</u>	<u>Total Cost</u>	<u>Notes</u>
Assumptions (see below for calculations)					
Repository area	10200 sy				
Repository perimeter	1818 lf				
Site Prep and Construction					
Grade and compact subgrade	10200 sy		\$ 3.00	\$ 30,600.00	
Run-on/runoff controls					
Construct	1818 lf		\$ 50.00	\$ 90,895.54	
Place Riprap	1818 cy		\$ 25.00	\$ 45,447.77	
Cushion layer of sand/gravel	3400 cy		\$ 15.00	\$ 51,000.00	Assume 1' layer
Geomembrane liner	10200 sy		\$ 14.70	\$ 149,940.00	
Drainage layer of sand and gravel overlain by filter layer of graded s	10200 sy		\$ 11.70	\$ 119,340.00	Assume 3' layer
PVC piping to convey leachate to pond system	2000 lf		\$ 35.00	\$ 70,000.00	
Berms (if wet repository)					
Process, haul, and place compacted soils for the berms	5050 cy		\$ 7.00	\$ 35,348.27	Assume 5' high, average width 15"
Treatment System for Leachate	1 ls		\$ 50,000.00	\$ 50,000.00	
	Subtotal			\$ 642,571.58	
General					
Administration			4.25%	\$ 27,309.29	
Quality			1.75%	\$ 11,245.00	
Temporary Facilities			1.25%	\$ 8,032.14	
Mobilization, Execution, and Demobilization			7.75%	\$ 49,799.30	
	Subtotal			\$ 738,957.32	
Other Costs					
Contingency		15%		\$ 110,843.60	
Project and Construction Management		15%		\$ 110,843.60	
Engineering Design		12%		\$ 88,674.88	
	TOTAL CAPITAL COST - Year 0			\$ 1,049,319.40	
Initial Solids Placement					
Haul and place dried solids	34000 cy		\$ 5.30	\$ 180,200.00	
General					
Administration			4.25%	\$ 7,658.50	
Quality			1.75%	\$ 3,153.50	
Temporary Facilities			1.25%	\$ 2,252.50	
Mobilization, Execution, and Demobilization			7.75%	\$ 13,965.50	
	Subtotal			\$ 207,230.00	
Other Costs					
Contingency		15%		\$ 31,084.50	
Project and Construction Management		15%		\$ 31,084.50	
Engineering Design		12%		\$ 24,867.60	
	TOTAL INITIAL SOIL PLACEMENT COST			\$ 294,266.60	

Repository

Solids volume

Repository Area for Initial Solids Placement

Placement of Additional Site Soils or long term wastes is not included

Volume for disposal - Assume 1996 Paser solids volume estimate of 68,000 is reduced by 50% after in-pond and additional drying
(Same as volume used for excavation and placement of solids in drying facility due to the uncertainty in volume reduction.)

$$34000 \text{ cy} \quad V * (27 \text{ cf/cy}) * (\text{acre}/43560) = \quad 2.107438017 \text{ acres} \quad = \quad 91800 \text{ sf}$$

Approximate Perimeter

1817.9109 feet

Adit Controls

	<u>Number</u>	<u>Unit</u>	<u>Unit Cost</u>	<u>Total Cost</u>	<u>Notes</u>
Adit Collapse Area Investigations	1	ls	\$ 10,000.00	\$ 10,000.00	Estimate
Detailed survey and Site Reconnaissance					
Detailed survey and seep identification	3	days	\$ 3,000.00	\$ 9,000.00	Estimate
Panoramic photos	1	ls	\$ 1,000.00	\$ 1,000.00	Estimate
Flow characterization	1	ls	\$ 10,000.00	\$ 10,000.00	Estimate
Adit Investigation Plan Technical Memo	1	ls	\$ 10,000.00	\$ 10,000.00	Estimate
TOTAL INVESTIGATIONS				\$ 40,000.00	
Adit Field Investigation					
Boring into St. Louis Tunnel	1	ls	\$ 60,000.00	\$ 60,000.00	Assume 1 boring 400-500 feet long. Run camera into boring
Exposed Adit Collapse Area					V = 200' * 3' * 10'
Excavate and dispose collapse debris - 200' exposed adit	222	cy	15 \$	3,333.33	Assume load and haul debris from 200 feet of adit 3 feet deep and 10' wide. On-site disposal. Full excavation of adit area is not included.
Water collection structure	1	ls	36000 \$	36,000.00	
Water collection channels	300	lf	80 \$	24,000.00	
Surge basin					Assume surge basin is 1/2 acre lined facility with berms A = 43560/2=21780sf = 21780/9sy = 2420sy P = 148*4
Grade and compact subgrade	2420	sy	\$ 3.00	\$ 7,260.00	
Run-on/runoff controls					
Construct	592	lf	\$ 50.00	\$ 29,600.00	
Place Riprap	592	cy	\$ 25.00	\$ 14,800.00	
Cushion layer of sand/gravel	550	cy	\$ 15.00	\$ 8,250.00	
Geomembrane liner	2420	sy	\$ 14.70	\$ 35,574.00	
Bulkhead					
Dewatering	1	ls	\$ 100,000.00	\$ 100,000.00	
"Portal" rehabilitation - new entry to underground worki	1	ls	\$ 35,000.00	\$ 35,000.00	
Adit rehabilitation	500	lf	\$ 570.00	\$ 285,000.00	Estimated Includes adit cleanup, ventilation and communication systems, shotcrete placement, rockbolt installation Assume 100 LF, 10'x10' of underground workings requires excavation
Underground Blockage Removal	370	cy	\$ 60.00	\$ 22,222.22	
Arch Culvert	1	ls	\$ 30,000.00	\$ 30,000.00	
Bulkhead Construction	1	ls	\$ 250,000.00	\$ 250,000.00	Prepare plug area, install dowels, form and place concrete, pressure grout plug area, HDPE piping and control valves
Miscellaneous materials and equipment	1	ls	\$ 10,000.00	\$ 10,000.00	
Subtotal				\$ 951,039.56	
General					
Administration			4.25% \$	40,419.18	
Quality			1.75% \$	16,643.19	
Temporary Facilities			1.25% \$	11,887.99	
Mobilization, Execution, and Demobilization			7.75% \$	73,705.57	

Adit Controls

	<u>Number</u>	<u>Unit</u>	<u>Unit Cost</u>	<u>Total Cost</u>	<u>Notes</u>
		Subtotal		\$ 1,093,695.49	
Other Costs					
Contingency		20%		\$ 218,739.10	
Project and Construction Management		15%		\$ 164,054.32	
Engineering Design		12%		\$ 131,243.46	
TOTAL CAPITAL COST				\$ 1,607,732.37	

Mine Investigation

	<u>Number</u>	<u>Unit</u>	<u>Unit Cost</u>	<u>Total Cost</u>	<u>Notes</u>
Investigations					
Review existing data and prepare Investigation Plan	1	ls	\$ 40,000.00	\$ 40,000.00	Includes detailed investigation of mine mapping, GIS surface mapping, hydrology/hydrogeology, historic records, etc.
Conduct investigation					The more effort that is put into this work, the more focused and cost effective the subsequent work will be.
	1	ls	\$ 80,000.00	\$ 80,000.00	
Additional Studies				\$ 130,000.00	Rough estimate
Design and Construction of Source Water Controls				\$ 500,000.00	Rough assumption for source water controls that may include diversion channels, a bulkhead, grouting, plugs or other means to reduce the inflow of water.
TOTAL - SOURCE WATER INVESTIGATIONS AND CONTROLS				\$ 750,000.00	

Water Treatment

	<u>Number</u>	<u>Unit</u>	<u>Unit Cost</u>	<u>Total Cost</u>	<u>Notes</u>
Water Treatment Technology Screening Report					
Characterize adit discharge flow and water quality	1 ls		\$ 10,000.00	\$ 10,000.00	
Screening study with conceptual designs	1 ls		\$ 30,000.00	\$ 30,000.00	
				\$ -	
Conceptual Design and Additional Investigations					
Bench scale tests	1 ls		\$ 10,000.00	\$ 10,000.00	Previous treatability study results are not available and may impact this estimate.
Pilot scale tests	1 ls		\$ 80,000.00	\$ 80,000.00	
Geologic/geotech analysis				\$ -	May be included in solids management task
Groundwater investigations				\$ -	May be included in solids management task
Hydrologic analysis				\$ -	May be included in solids management task
Additional solids handling or dewatering studies	1 ls		\$ 20,000.00	\$ 20,000.00	
TOTAL COST - SCREENING AND INVESTIGATION				\$ 150,000.00	
Construction					
Upgrade lime storage and addition facility	1 ls		\$ 130,000.00	\$ 130,000.00	Estimate
Automated monitoring equipment	1 ls		\$ 50,000.00	\$ 50,000.00	Estimate
Building upgrades	1 ls		\$ 25,000.00	\$ 25,000.00	Estimate
Pond upgrades					
Reinforcements					
Strip and compact existing slope and toe area	667 sy		\$ 5.00	\$ 3,335.00	Assume 1000 linear feet 6 feet in width
Place filter blanket and drainage blanket on s	667 sy		\$ 4.00	\$ 2,668.00	Assume 1000 linear feet 6 feet in width
Place fill to protect filter/drain zones	600 cy		\$ 10.00	\$ 6,000.00	
Drainage relief and/or piping protection in dc	1 ls		\$ 10,000.00	\$ 10,000.00	
Hydraulic structures	10 ea		\$ 8,000.00	\$ 80,000.00	Assume new structures for all current ponds
Bypass piping	1650 lf		\$ 80.00	\$ 132,000.00	See inset box at bottom of page for length calculation
Construct pond 16/17					
Materials handling - excavation or berms	15000 cy		\$ 15.00	\$ 225,000.00	
Install dikes	2700 cy		\$ 7.00	\$ 18,900.00	
Hydraulic structures	1 ea		\$ 8,000.00	\$ 8,000.00	
Bypass piping	200 lf		\$ 15.00	\$ 3,000.00	
	Subtotal			\$ 693,903.00	
General					
Administration			4.25%	\$ 29,490.88	
Quality			1.75%	\$ 12,143.30	
Temporary Facilities			1.25%	\$ 8,673.79	
Mobilization, Execution, and Demobilization			7.75%	\$ 53,777.48	
	Subtotal			\$ 797,988.45	
Other Costs					
Contingency		20%		\$ 159,597.69	
Project Construction Management		15%		\$ 119,698.27	

Water Treatment

Engineering Design

<u>Number</u>	<u>Unit</u>	<u>Unit Cost</u>	<u>Total Cost</u>	<u>Notes</u>
	12%		\$ 95,758.61	
TOTAL CAPITAL COST			\$ 1,173,043.02	

<u>Pond</u>	<u>Feet bypass piping</u>
18	450
15	450
14	250
<u>12 and 11</u>	<u>500</u>
Total	1650